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硕 士 学 位 论 文

新型自锁式液压缸的研制

The Study on the New Type of Self-locked Hydraulic Cylinder

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摘　要

在液压系统中，以液压缸作为执行器时，有时需要使液压缸在任意位置或某一定点位置保持停留并承受一定的负载力，目前常用液压锁紧回路来实现该目的。但在航空、军事等特殊领域，如飞机舱门，潜艇的各分隔舱等，用普通液压锁（靠油压锁紧）无法满足其可靠性要求。它们需要执行器工作位置有高精度、长时间停机而无任何位移变化 ，安全性好，采用液压锁紧回路达不到这种要求。在这种背景下，本文设计了一种新型的自锁式液压缸，这种缸能通过自身的机械结构达到锁定的目的。

本论文主要研究工作如下：

1.详细了解国内的液压缸生产和发展水平，国外在这方面的先进技术及发展趋势，提出了液压缸自锁的解决方案。

2.研究了各种液压缸的结构性能及密封特性，对液压缸进行创新性设计，即自锁式液压缸。该缸在断油或漏油的情况下，均能通过自身锁块卡死活塞杆，另一改进之处是，借助节流阀，自锁式液压缸内部的阶梯型和圆锥型的复合缓冲结构能很好的改善液压缸工作时普遍存在的冲击现象。

3.根据载荷和工作条件，确定了液压缸结构尺寸、密封所要达到的精度等，对液压缸的受力、变形、活塞杆伸出速度等进行了理论分析和计算，并用 ANSYS 软件进行仿真分析。

4.设计了全套自锁式液压缸图纸。

5.设计了自锁式液压缸的测试系统。

6.完成了自锁式液压缸的样品生产，并用厂家现有的测试设备对样品进行了初步测试，对测试过程中暴露出来的设计缺陷进行了改进设计。使该自锁式液压缸在国内同类产品中达到领先水平。

关键词：液压缸；自锁式；液控压力锁

Abstract

In the hydraulic system, sometimes the hydraulic cylinder needs to stay in any position or a certain position and endure a certain loading power when the hydraulic cylinder is used as an actuator, so the loop is often locked by hydraulic to accomplish this aim now. But in some particular fields of aviation and military affairs, such as cabin doors of the planes, subdivision bulks of submarines, etc, normal hydraulic locker (locked by oil) cannot fulfill their capable requirements.

They need high accuracy in working position, no moving during long-time's stop, fine security. But using the loop hydraulic locker cannot satisfy such requirement. In this background， we design a new type of self-locked hydraulic cylinder which can be up to scratch through the mechanical frame of itself in this thesis.

The study work of this thesis is as follows：

1. Analyed the producing and developing level in China and the advanced technology and developing trend overseas in detail. Then raise some solutions for the hydraulic cylinder which locked by itself.

2. Study the configuration capability and hermetic characteristics of all kinds of hydraulic cylinders. Innovatively design the hydraulic cylinder, which is the self-locked hydraulic cylinder. In the condition of oil lacking or seeping, it can lock the piston rod by itself. The other innovation is that with the help of throttle, the complex buffering frame of ladder and conical shape inside of the self-locked hydraulic cylinder can easily solve the ubiquitous problem of impact.

3. According to the working condition and bearing load, confirm the size of the hydraulic cylinder's frame and the accuracy the airproof should reach, etc. And then theoretically analyse and calculate the loading, distortion and the porrect speed of the piston rods. Analyse the frame's distortion in the condition of loading with ANSYS software.

4. Design the entire drawing of the self-locked hydraulic cylinder.

5. Design the testing system of the self-locked hydraulic cylinder.

6. Achieve a sample of the self-locked hydraulic cylinder, and test the sample with the manufacturer's appropriative testing machines. Improve and optimize its bugs and shortages. Make this self-locked hydraulic cylinder reach the advanced level in domestic concentric production.

Keywords：Hydraulic cylinder；Self-locked；Hydraulic controlling pressure locker

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